DOCUMENT RESUME

ED 408 170 SE 060 254

AUTHOR Davis, Kathleen S.
TITLE Science Support Groups and Women Science Educators: Advocates for Women's and Girls' Legitimate Participation in the Science Community.
PUB DATE Apr 96
NOTE 44p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (St. Louis, MO, April, 1996).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Educational Strategies; Elementary Secondary Education; Equal Education; *Hands on Science; Higher Education; Participant Observation; *School Community Relationship; Science Activities; *Science Clubs; Science Instruction; Scientists; *Self Directed Groups; Technology; *Womens Education

ABSTRACT

This paper contains descriptions of some of the specific kinds of capital that are needed, sought, and used within two academic science support groups for women and girls that aim to be gender-sensitive. The ways in which the capital (cultural, economic, symbolic, and social) is acquired, the ways in which the groups interacted with the larger community, and how these groups create opportunities for women and girls are discussed. The paper addresses questions that pertain to the ways that group participants acknowledge, value, or discredit the capital prescribed by the science community; what type of capital is preferred; what forms of capital remain hidden from the participants' view; and what barriers prohibit the participants' full access to the capital perceived as needed by the science community. Data for this study is in the form of interviews of the leaders and participants from both the women in science group and the grade 7 through 12 science club, field notes taken during participant observation of group meetings, and analysis of group materials and other documents. Contains 37 references. (DDR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 408 170

Science Support Groups and Women Science Educators:

Advocates for Women's and Girls' Legitimate Participation in the Science Community

by

Kathleen S. Davis
University of Colorado--Boulder

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

K. S. Davis

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, April 1996, St. Louis, Missouri.

SE 060 354

BEST COPY AVAILABLE

INTRODUCTION

Substantial research documents the under-representation of women and girls in science-related careers and science coursework (AAUW, 1992; National Science Foundation, 1992; Oakes, 1990; Vetter, 1992). In addition, even today amidst the implementation of progressive science education reform, educational institutions, organizations, and policy-makers continue to establish policies that are "gender-blind" in that they ignore the issues and experiences unique to women and girls and fail to address important aspects of women's and girls' education that are critical to their futures (AAUW, 1992; Harding, 1991; Martin, 1992). "Gender-blind" institutions and individuals often attempt to achieve educational equity by treating both genders equally perpetuating "gender-bias" (AAUW, 1992; Martin, 1992).

In contrast, institutions, organizations, and individuals must recognize the need to be "gender-sensitive" and acknowledge the experiences and needs of women and girls when designing and implementing policy, curricula, and instructional strategies (Martin, 1992). There are programs and groups throughout the country that aim to be "gender-sensitive." They have attempted to provide girls and women with opportunities to engage in science and have had a positive impact on women's and girls' interest, course-taking plans, actual course selection in math and science, and their retention in academic programs (AAUW, 1992; Hall and Sandler, 1982).

However, little is known about the ways in which such groups provide their participants with the capital (cultural, economic, symbolic, and social) necessary for legitimate participation in the science community. Capital is what one has, uses, and/or acquires in order to take part in the practices of a group, and it takes several forms (Bourdieu and Wacquant, 1992). Cultural capital is defined as "primarily legitimate knowledge" as described by the group and includes conceptual knowledge, skills, and tacit competencies (Jenkins, 1992, p. 85). Social capital is defined as the "valued relations one has with...others" who serve as actual or potential resources; economic capital includes money, assets,

fellowships, etc.; and symbolic capital is defined as "prestige and social honor" (Bourdieu, 1986; Jenkins, 1992, p. 85).

Bourdieu claims that

> [A] species of capital is what is efficacious in a given field, both as a weapon and as a stake of struggle, that which allows its possessors to wield a power, an influence, and thus to exist, in the field under consideration, instead of being considered a negligible quantity. (Bourdieu and Wacquant, 1992, p. 98)

Bourdieu further argues that one's "relative force" or "position" within a community and "the moves that she makes..." depends "on the volume and structure of her capital...at the moment under consideration..." (p. 99) In order to define a community and its boundaries, it is important to "identify the specific forms of capital that operate in it," what is needed to legitimately participate, and what is sought (Bourdieu and Wacquant, 1992, p. 108).

In this paper, I describe some of the specific kinds of capital that were needed, sought, and used within two academic science support groups for women and girls that aimed to be "gender-sensitive." I discuss the ways in which that capital was acquired, the ways in which these groups then intersected with the larger science community, and, therefore, how these groups provided opportunities for women and girls to participate legitimately and create change in the science community.

In this paper, I address the following questions:

- In what ways do the participants of these groups acknowledge, seek, use, or ignore; value or discredit the capital prescribed by the science community?
- What "species of capital" do they prefer and/or possess (Bourdieu and Wacquant, 1992) and in what ways are they consistent with or in dissonance with the capital valued by science and scientists?
- What forms of capital remain hidden from the participants' view?
- What barriers--what ideologies, structures, and practices prohibit the participants' full access to the capital perceived as needed by the science community?

In addition, in previous work, I found numerous examples of teachers, primarily men, who served as door-openers and gatekeepers to the progress of women in their careers in science (Davis, 1991). What do door-opening and gatekeeping practices look like? Lave and Wenger (1991) contend that as one shapes "the relation of masters to apprentices," it is the issue of "conferring legitimacy" upon newcomers' participation in the community that "is more

important than the issue of providing teaching" (p. 92). They argue that student acquisition and mastery of knowledge "resides not in the master but in the organization of the community of practice of which the master is part" (p. 94). Engagement in the community's practices is what is key to the acquisition of the community's capital and identity.

Stanton-Salazar, Vasquez, and Mehan (1995) point out that individuals, such as teachers, who have positions of power within a "formal institutional context" and "the capacity and commitment to...provide or negotiate the provision of resources, support and opportunity for others" can act as "institutional agents" (p. 3). These researchers explain that

> institutional agents have the power to access, in multiple ways, various resources and opportunities under the control of either their own institution or neighboring institutions. Their status as agents is activated when they access resources on behalf of others..." (pp. 3-4.)

"Institutional agents" can provide students and others with forms of support so that they might progress through institutional systems and be able to "exercise considerable control over their lives and futures" (p. 3). Therefore, science educators might act as "institutional agents" as well as "allies" (Gilligan, 1990) for girls and women who are novices to science and provide them access to the capital that is needed in order to legitimately participate within the science community.

However, institutions and their agents have the power to not only enable individuals to access valued capital but also to interrupt such opportunities. They often have the power to limit or withhold individuals' access to full participation within the group and therefore influence the quantity and quality of capital and identity that is acquired (Lave and Wenger, 1991; Sennett and Cobb cited in Stanton-Salazar, Vasquez, and Mehan, 1995).

Integral to what happens in the science education setting, therefore, is the educators' personal knowledge, beliefs, and experiences (Connelly and Clandinin, 1988). However, little is known about the knowledge, beliefs, and experiences that influence their work and their practices. Therefore, this paper will also address these questions:

- How do the personal experiences, knowledge, and beliefs of these educators aid women's and girls' access to the capital needed for legitimate science participation?

•In what ways do the women science educators who facilitate these groups serve as "institutional agents" (Stanton-Salazar, Vasquez, and Mehan, 1995) and as "allies" (Gilligan, 1990) for women's and girls' participation in science?

STUDY SITES AND METHODOLOGY

Explorers [1]

Explorers is an after-school science club where girls, ages 7-12, engage in hands-on science activities under the guidance of a woman science educator. The club is one of several programs offered at a co-ed city youth club which is located in an urban community situated near the Rocky Mountains. The Foothills City Youth Club (FCYC) operates two centers within the community--an after-school child care facility located on the north side of the city and a walk-in recreational facility located in a city housing project on the south side of Foothills City. Over the course of this study, a total of 55 girls attended the Explorers sessions, and the average attendance of each club meeting was approximately six girls. Two women science educators facilitate these groups.

The FCYC's membership is racially and ethnically diverse. Of the children served, 65% are Latino, 26% are white, and 5% are African-American. (Four percent are unreported.) Seven percent are developmentally, emotionally, or physically challenged/disabled. The families served by the youth club are primarily from "disadvantaged circumstances." More than 50% of the children who are FCYC members live in single-parent homes where working females are the head of the household. Seventy-seven percent of the children who come to the Foothills City Youth Club live at or below the level of poverty. Fifty percent of the children's families receive some kind of public assistance.

Explorers is a national Girls' Club program focused on providing girls with hands-on, engaging science activities and with community networking with professional women in non-traditional careers. Their goals are to stimulate girls' interest in science, math, and

---

[1]Throughout this paper, pseudonyms are used for the names of programs, individuals, organizations, and locations to protect the anonymity of the participants in this study.

technology," and to motivate girls to "stick with" math and science courses and so that they may consider and pursue careers that have been traditionally closed to them and so that they have the ability to be "responsible and contributing" citizens within their communities.

Women in Science

The second study group --Women in Science (WIS)--consists of eight university women working in science at an academic research institution located in the western United States. The group includes professors, graduate students, researchers, postdocs, and science educators. The WIS participants are white and middle class, though many come from working-class backgrounds. The group is facilitated by a tenured professor. WIS members meet to discuss issues important to them and other women in the profession and to construct ways to create change within the science community so as to further access participation for themselves and others.

Methods

Data for this study was collected in the form of 1) interviews of the leaders and participants of each group, 2) field notes taken during participant observation of group meetings, and 3) analysis of group materials and other documents (Spradley, 1980). The analysis includes particular description in the form of vignettes and direct quotes, general description in the form of taxonomies and diagrams, and interpretive commentary to provide explanation and connection within the analysis (Erickson, 1986). Below, I present the results of the Explorers club and then the results of the Women in Science group. My final discussion will draw together the findings from both sites.

RESULTS

Explorers

Introduction

As Explorers leaders at the FCYC, Carmen and Linda, have the "position" and "capacity" to provide Explorers members with resources, support, and opportunity (Stanton-Salazar, et al., 1995). As "institutional agents," they provide girls access to the cultural, economic, social, and symbolic capital of the science community by providing girls with 1) structured programs that engage them in the process of scientific inquiry, 2) encouragement to take risks, and 3) connections with non-traditional role models and support structures inside and outside of the FCYC. However, within this setting, institutional barriers, cultural and societal expectations, and hegemonic social structures and practices also serve as obstacles to girls' legitimate participation in science and to acquisition of valued capital. Below I describe how multiple factors, including the beliefs of the Explorers leaders, act as door-openers and gatekeepers to girls' participation in science.

Providing Girls with Entree into Scientific Inquiry

The goal of the Explorers program is to motivate girls to become involved in the process of science where girls ask questions, do things with their hands, "get dirty," and, thus, become engaged in scientific inquiry. The science community values the process of scientific inquiry: being curious, exploring new phenomena, asking physical, biological, and/or social questions, seeking answers, predicting, doing investigations, making observations, collecting verifiable data, checking results, comparing different theories, and being open as well as skeptical of new ideas (AAAS, 1989). In the Benchmarks for Scientific Literacy, the authors state:

> Students should be actively involved in exploring phenomena that interest them....These investigations should be fun and exciting, opening the door to even more things to explore (AAAS, 1993, p. 10).

The authors of the Explorers program and Explorers leaders at the FCYC believe that the presentation of science concepts in schools is not enough to engage girls and to develop

scientifically literate citizens. The Explorers leadership contends--and previous research has shown (Davis, 1991)--that the scientific process of answering questions and solving problems is an intriguing and engaging aspect of science and that such experiences are absent from most girls' school experience.

The intent of the club's focus on inquiry is to provide girls with experiences in science that "they don't get in other places" such as home and school (emphasis in original document). The leaders choose activities where Explorers members "get dirty" and have fun. Getting dirty implies that the participants 1) truly participate instead of merely watching someone else, 2) have "hands-on, manipulative, participatory experiences that make learning fun," and 3) are empowered by "tak[ing] charge of their immediate environment." Through such experiences, the Explorers leaders hope to motivate girls to stay with science coursework and to learn science content in the context of school.

The leaders play a critical role in creating the Explorers program and in providing it to the girls. The leaders determine each session's objectives; design and plan the Explorers activities; collect, organize, and provide girls with necessary materials; and introduce the goals and tasks for each of the sessions. With their questions, the leaders guide the group discussions and determine the focus of Explorers activities. Such questions as "What do you think?" "Why do you think that?" "Why did this happen?" "What is...?" "What's that called?" "What clues are you looking for to help you?" "What is the difference?" "What made the difference?" "How do you think we should begin?" elicit from the girls their knowledge and beliefs as well as what approaches they can and have used to solve problems and complete tasks. Such questions also direct Explorers members' thinking, their observations, and their actions.

The girls' explorations consist of hands-on, minds-on activities where they gather information, develop skills, and use a variety of everyday tools such as measuring spoons and cups, rulers, scissors, and screwdrivers to do such things as measure, mix, count, sort, describe,

BEST COPY AVAILABLE

take apart, reassemble, and construct. (See Chart 1.) Such activities are followed with opportunities to reflect, to discuss, and to "process" what the girls did and what they learned.

The vignette *Being Like Birds* illustrates the ways in which girls engage in the process of scientific inquiry in Explorers.

Being Like Birds

It is a Thursday afternoon at the North Side center of the Foothills City Youth Club (FCYC). In the back room used for programs and activities, Carmen sits on the floor with the 10 girls, ages 6-12, who had come to Explorers this afternoon.

Carmen writes down their names as they introduced themselves, and they each tell about a bird that they know. They talk about all kinds of birds, lots of birds. They mention a rooster and also eagle, and an owl. Oh! they had been to the zoo and they had seen how the owl could turn her head all the way around. They were really impressed with that. Yalonda, who is 6, talks about the peacocks that she saw while at the zoo and their beautiful feathers. Carmen describe some birds to see if the girls can identify them like one that is pink and stands on one leg and another that lives near the water where it is really cold. The girls talk about the penguin and wonder if it has feathers or not. They talk about how it doesn't fly like other birds.

"What makes birds different?" Carmen asks. The girls all shout out and try to talk, and Carmen tries to call on each one. The girls talk about their feathers and the colors and the kind of feet they have, the size of their eggs and the kinds of eggs, and their beaks. They mention all of these things, and then Carmen says that today they are going to be birds.

She begins by talking about one of her favorite scientists, Jane Goodall, and how she had gone to live with--she asks if they know what animals that she studies. None of the girls know. Carmen said that one of Jane Goodall's favorite animals is the chimpanzee and that she went to live with them to find out more about them. She sat and watched them until they got to know her. Then she started to act like them, and then they kind of accepted her as part of them, and so that is how Jane Goodall found out about chimpanzees. Carmen tells the girls that today they are going to be scientists and they are going to be birds and find out more about them in that way.

The girls are going to be birds that have different kinds of beaks. Carmen then shows them four different tools that the girls can use as their beaks: a toothpick, a clothespin, pair of tweezers, and a spoon. They can only use their beak and not their hands to pick up whatever food they are given. Carmen asks the girls which tool they want to use and passes them out so that they all have a beak.

Carmen then shows the girls the different kinds of food that they are going to try to collect and eat. In an aluminum pan there are beads that are supposed to be snails and raisins that are supposed to be grubs. She has boiled some macaroni in the kitchen to use as worms. She has Styrofoam packing peanuts floating in a pan of water to be water insects and animals.

Then she asks, "Where does the food go? Where does <u>your</u> food go? Where does the food go when the birds eat it?" Carmen then tells them, "Well, in your body--the stomach. So these, so these will be your stomachs." She passes out paper cups for the girls to use as stomachs for their birds. She shows the girls how they should put the food items in their stomachs and how they will then talk about how they did with each tool. Then the girls will then put the food that they gather into a plastic ziplock that will serve as their evidence bag.

Beads are spilled out on the floor. I do very poorly as I try to gather them up using my tweezers. The girls who have toothpicks put them into the holes that are in the beads as they soon realize that poking the hard beads will not work. The macaroni is really soft and mushy, like worms are anyway, so they could be stabbed. The toothpick is a real good beak to have if

you are looking at a mushy worm. Each time as we get down to the last few pieces of food that are left, we start battling over the remaining pieces and stealing food from each other. We talk about how that is what happens in the animal world.

As we finish each food item, Carmen asks, "Who got the most food? Who got the least? Why did you get the most? What was there about your beak that made the difference?" Carmen adds, "As a bird, you wouldn't be able to eat everything. It'd be really hard." Stephanie says, "With a certain kind of beak, birds probably eat a certain kind of food, like fish." "So what kind of birds eat fish?" Carmen asks. The girls talk about how pelicans use their beaks to eat fish. Carmen uses her hands just to show the bottom part of their beak, that there is this sort of big bag in which the pelican captures and holds the fish.

Then Carmen asks, "What is a food chain?" Stephanie replies, "That's about the birds eating the fish. When a big fish eats the little fish and another little fish." Carmen asks, "Where's that in the food chain. What eats the bird?" The girls talk about animals that might eat birds and how it would depend on what part of the world or environment the bird was located.

The session is about out of time and the older girls begin to pick up their things and to leave. One little girl wants to count out how many of each type of food she has collected. She reports that she has so many raisins, and then she begins to count her beads. Carmen talks about how she can graph her results. As the older girls start to leave, they hear the talk about the graph and want to graph their results as well. So Carmen tells them to save their evidence bags and that they will do the graph the next afternoon.

Marissa and Barbara and two other little girls have gone off to the side of the room where there are some folding chairs arranged in a circle. Singing an indecipherable song in soft, high voices, these little girls begin to walk along the seats of the chairs in a circular path, flapping their arms like birds winging across an open field. There is a break in the circle, and they jump down from the last brown folding chair and then step up to the next one where the circle resumes, all the time flapping their wings. Around and around they soar, singing their song of flight.

Carmen and I look over, first with wonderment, and then with smiles on our faces. "I want Explorers to be fun," Carmen says softly to me. "I want them to feel good so they'll come back next time. I think that's what I'm supposed to be doing as much as sometimes I like to have them all sit and listen. They need to learn to walk on chairs, to fly around, and to act like birds."

As I watch, I think that their play looks like so much fun that I too want to get on the chairs and fly like a bird. The girls continue their song and their flight around the brown folding chairs, captured by the moment and by what it feels like to fly like birds.

Explorers leaders believe that it is important to encourage girls to explore, discover, be creative, take risks, and get messy and to acknowledge them for who they are and what they know in a context that is free of discouraging comments and/or expectations. The leaders believe that it's important for girls "to feel good so...they'll come back" and to encourage them "to be curious," to ask questions, "to be more risk-takers, [and to] try [things] and not worry about getting dirty."

Explorers leaders state that it is important that girls do things where they are not only "active," but that they also have fun. That the activities are fun is critical as it ensures that

each individual is involved as that is when "each person learns best." "I want it to be fun," says Carmen. "[N]othing is going to happen for them if it's like school already which usually the science and math isn't too much fun...I would say 75% of the teachers (in Foothills City), especially the science and math, are teaching in a more traditional format." Many of the Explorers members indicate that one of the reasons that they come to the program is because it is fun.

Clearly, the Explorers members and leadership see that the program is not school; they are not about teaching and learning a great wealth of content knowledge. Yet the program seeks to support what its members can learn in school. The director of the FCYC states, "[Explorers is] really a non-traditional educational experience. It's more experiential. We're not teachers; we're facilitators. We have activities and sessions; we don't have classes."

Carmen describes her role as presenting science as

> discovery and their curiosity....[T]hat is what science is...discovery and fun....[T]hat's my contribution to them....[T]hen, as they go in to school, they have some knowledge [and] then [there is]...somebody...[who] can help them stand on their knowledge base and on their foundation of being and that would be [my] significant contribution.

Through the process of engagement and reflection in scientific inquiry, the leaders believe that the Explorers members may acquire self-confidence and some new knowledge, especially about the process of science, that will be useful to the girls as they participate in daily life and in the school classroom.

The Explorers leadership recognizes the need for girls to acquire the institutionalized and objectified cultural capital of coursework, degrees, and diplomas in order for them to legitimately participate in science and associated non-traditional careers. Program leaders hope that the activities will motivate girls to seek out science experiences. They hope that girls will be motivated to stay with school science throughout their educational years so that they may choose from a variety of non-traditional careers. Schools, therefore, are viewed as the primary context where success will be achieved, although the Explorers program documents and leaders contend, and this study and other educational researchers (Sadker, Sadker, and

Klein, 1990; Oakes, 1990; Bourdieu, 1986) confirm, that actual opportunities for legitimate peripheral participation are limited in schools. Therefore, though Explorers may provide its participants with the motivation and self-confidence that they need to self-select for themselves membership in the science community, the group does not address how girls might continue their legitimate peripheral participation through scientific inquiry within the context of school science.

In addition, Lave and Wenger (1991) point out that it is through experiences (i.e., scientific inquiry) in a community of practice that valued capital (i.e., basic knowledge and skills) is acquired. However, most individuals do not experience science in any authentic way during their educational careers. These practices of the community are usually reserved for those engaged in graduate or research study that occurs beyond the K-12 academic years. Eisenhart, Finkel, and Marion (in press) contend that it is through authentic scientific inquiry and problem-solving experiences that students actually have access to the sophisticated knowledge of the science community. Therefore, schools and groups, such as Explorers, need to give much thought as to the kinds of practices that they access to learners.

Also, Explorers leaders might further empower girls by increasing their role in the construction and implementation of the Explorers program. Though members make their own decisions about what to do within activities, they rarely have much say about what questions or problems they will explore or what investigations and/or projects they will do.

The national Explorers program encourages leaders to let girls choose what they want to explore and, with the help from their leader, determine how to go about the task that they have chosen. Girls' feelings of power come, first of all, when "they make choices based on their own perceptions and judgments." Girls can feel empowered when "they make decisions affecting policy; they feel entrusted in leadership roles... and they appreciate the effects of their actions on others."

Nicholson and Fredericks (1991) posit that

> girls who have experience in making decisions and leading others and who have taken charge of their own learning, believing in their ability to succeed

> and with support from adults for their own high expectations, are those more likely to persist in math, science, and technology. (p. 125)

As a result of their research, they recommend that "girls make decisions and exercise genuine, if shared, authority over policies and practices that affect their lives....At the very least, girls should be more involved in setting the agenda for the programs in which they choose to participate" (p. 127).

Some Explorers members value what leadership roles they do have within Explorers and the FCYC. One member shares how it "is fun" to "help...and to work with kids" in Explorers. However, Nicholson and Fredericks (1991) point out that such peer leadership opportunities can be further developed into "collegial relationships" between adults and peer leaders where, together, they "jointly [plan] the agenda and strategies for learning" that would result in girls' further empowerment (pp. 126, 128).

Such a setting may require the Explorers leader to be more of a "guide on the side" or a facilitator. As one leader pointed out,

> [S]ometimes I get more structure than I would like to...have things be....[M]y role ends up being sometimes like a...traditional teacher, saying like, "Come on in girls; we're going to do this"....I'd like to see it more over to the facilitation side...to really give them some control...give it over to them...

Educational researchers point out that in settings where the educator is a guide, he or she

> monitors the functioning of the learning groups and intervenes...when it is needed. The teacher is more a consultant....Other students are perceived to be the major resource for assistance, feedback, reinforcement, and support. (Johnson and Johnson, 1994, p. 102)

Johnson and Johnson (1994) point out that cooperative interactions with peers tend to provide individuals with greater skills and "social support" than other kinds of learning structures (Johnson and Johnson, 1994, p. 61). A "social system," which is made up of individuals who "collaboratively share...tasks and goals," provides "individuals with resources (such as money, materials, tools, skills, information, and advice)" that enhance the well-being of the group's members (p. 61). Individuals can promote the success of their peers by "helping, assisting, supporting, encouraging, and praising one another's efforts to learn" (p. 23).

Creating a Safe Setting for Sisterhood

As girls work together through the process of scientific inquiry, Explorers leaders hope that members will also develop a sense of "sisterhood." Linda describes this vision of sisterhood as

> supporting each other as women...identifying with one another...realizing we are all dealing with the same pressures and different influences: What our parents want us to be. What our significant others want us to be. Whatever society says we should be. [That we] don't fight with each other...[or] put each other down because of how we look, or [don't say], "I can't be your friend." That it's more "You're OK." [It's] a unity or [that] we can help each other...

Therefore, "sisterhood" is a type of social capital that would avail the girls of friendship as well as personal acknowledgment and support for who they are as girls and individuals and to pursue the personal and career goals that they value including the option to participate in non-traditional coursework and careers.

Though some girls come to Explorers to be with friends and to develop friendships, the level of interaction that the leaders describe as sisterhood is not yet embedded within the Explorers membership. The use of cooperative group structures in Explorers settings, as discussed above, might provide girls with a model or a bridge between working as individuals and interacting in close, supportive relationships. In addition, other factors such as: 1) cultural and societal expectations within and outside of the Explorers groups and the FCYC and 2) the lack of safe settings where girls might develop such connections with other girls serve to interrupt girls' development of sisterhood.

Cultural and Societal Expectations

Explorers leaders have knowledge about societal barriers and expectations that women and girls face in society. One leader describes how for the girls who come to the FCYC, especially those who come to the South Side Center, many of whom are Latina, there is a "tradition and real cultural emphasis" which includes the "expectations that are being put on them at home" to raise and care for a family. Many afternoons, girls, ages 12-14, can be seen hanging around outside the center with their boyfriends. Also, it is not unusual for girls to come

into the South Side Center, not to participate in FCYC programs, but to inquire as to the whereabouts of "my Marc" or "my Rick."

Within the context of Explorers and other programs, Linda and Carmen engage girls in thinking about and questioning the assertions that are made daily regarding women's and girls' roles in society through discussion and activities such as Odds on You, an EQUALS game that is about choosing a career and deciding one's future. Linda shares that when girls talk about their futures they still [say], "Oh, I want to be a nurse" or "...a homemaker" or "I just want to get married and have kids." Odds on You provides players with some insight into the ramifications of educational and career choices. As the girls play, some will say, "I don't want this!" as they encounter an unexpected consequence. Linda then responds with "OK, but what's this saying about education? If you don't finish high school or if you don't get some extra training or education, then what happens? What does it cost to run a home? How much do you want to spend on energy?" Through the context of a game, girls are asked to think critically about their future lives and careers and the outcomes of what decisions they may make.

Most of the Explorers members describe their futures as primarily taken up with the raising of children and the caring of a home. For example, when Corina is 30 years old, she believes that she will be "home, cooking...and [be] a housewife." She believes that she will do this because she cooks and cleans at home now. She believes that her future will also include raising a family. Yet, Corina also predicts that she will work as a lawyer and be "on the good people's side." She knows that in order to do this she will have to "go to college and...get a degree."

Fine and Zane (1991) report that low-income adolescent women--Latina, black, and white--are involved in caring for themselves as well as family members, that they do not resent these responsibilities nor think of them excessive, yet they "are often forced to sacrifice their own educations and aspirations in the service of others" (p. 86). Therefore, in order to successfully engage girls in non-traditional occupations, it seems important that teachers and

researchers not only consider issues of gender but also race, culture/ethnicity, and socioeconomic background (Hansen, Walker, and Flom, 1995).

Carmen, an Explorers leader who is Mexican-American, shares that though her mother was an "independent and resourceful person," her message to Carmen was that she would "get married and find a good husband"--that was "the most important thing." Moraga (1983) describes the Latino tradition that was modeled by her mother-- "nurturing/waiting on my father and brother all the days of her life. Always how if a man walked into the room, he was paid attention to [indulged] in a particular Latin-woman-to-man way" (p. xvi).

Trask (1986) discusses "the dynamics of the patriarchal family, especially female child-care" as a primary component of the "sexual understructure" from which women's oppression in grounded (Rich in Trask, 1986, p. 2). "[E[xclusive gender, heterosexuality, the sexual division of labor" are also basic elements of the "sexual understructure" (p. 18), which, together, provides one with a basis from which we can begin to understand women's oppression and "cultural subordination" (p. 18). Through sisterhood, girls and women may be able to construct a context for self-development and exploration and participation in non-traditional careers and practices. Sisterhood is grounded in a shared vision of "the refusal of self-sacrifice, the courage of self-creation, and the creation of female bonding" (Trask, 1986, p. 153). Trask (1986) contends that it is sisterhood that "enables women to survive and grow" (p. 153). Through such a "collective," women can define themselves, pursue self-expression and creation, and nurture and care for themselves all apart from and in contrast to traditional patriarchal definitions and ways (p. 162).

The Importance of Safe Settings

Carmen sees that there are few opportunities for the girls who come to the Foothills City Youth Club to spend time with just each other and to develop new personal goals and ways of being.

> There's not too many of those [places, as] schools [are] co-ed settings,...[and then]... after school, they are in their homes more than likely. It's all male-

> female so that now they have no opportunity to feel and accept the power that I think could come on up, more of a sense of sisterhood."

If the club was "just girls," Carmen thinks

> ...that [it] would eventually grow because then they (the girls) would sense that...good (feeling) to be able to just be yourself and not have to do this or do that to make boys notice you and [that] that's the most important thing."

Carmen views the Explorers' single-sex setting as important in order to foster girls' "sisterhood" within the FCYC's co-ed organization. Carmen states, "I think what's of value to the girls--...at least the minim[um] I can do is give them time...to be with just girls, that...space to be curious and to be encouraged....[W]hen there are just girls there...they can learn the positiveness and the power that can come from that."

What do girls think about being in a co-ed or single-sex setting? Carmen sometimes asks the girls in Explorers, "What would it be like if boys were here?" Their responses to that question are exemplified in the following vignette.

"What Would It Be Like If Boys Were Here?"

Carmen, the program director for the center, comes out of the back room where she has just finished the Explorers program for the boys and she quickly looks at the clock and picks up the sign-up sheet to see which girls are coming to Explorers today. She's interrupted by a girl and a boy, both about eight years old, who are fighting over a ball. "Leave her alone," Carmen warns the boy. "She said to leave her alone. Stop it! Give her--if she had the ball and you came and grabbed it from her, give it back." The boy reluctantly lets go of the red playground ball and mumbled something that Carmen could hear. "Sit over on the chairs in the front and take a time out," she says and she directs him to the gray cushioned chairs across from the front desk. She anxiously looks at the clock on the wall; the girls' Explorers class is now ten minutes late in getting started. She calls out for the girls who signed up for Explorers to come to the activities room in the back of the center.

Ten girls find their way to the back room and sit in the folding chairs that Carmen has put in a circle. The last girl in closes the door behind her. One girl is 15, but the others range in age from 7-12. Today's activity seems simple. Carmen has collected a wide variety of milk and juice cartons that she's cleaned out and she dumps them from a large, green, plastic bag onto the concrete floor. "You need to build something," Carmen instructed. "Here are the materials." She points to the cartons and to a wide assortment of construction paper, scraps of cardboard, and other types of paper in a large box that the girls could use. There are also some large plastic containers of white school glue.

The girls began to break up into groups and pairs and to talk among themselves, share their ideas, and discuss and deliberate what directions their constructions should take. They begin to create towers, houses, apartment buildings, shopping malls, and churches, adding interesting and important details. Maria, who is seven, seemed intent on the form her church was taking, trying to figure out just how the steeple should be made. "My mind is working," she shared as Carmen asked her about her work.

The door to the activity room opens and two boys walk in; they are about 10 years old and one is wearing sunglasses. Several girls shout at them, "No boys! Girls only! Girls only!" The boys stand around and look at what the girls are doing, making no motions to leave. Carmen tells them that they had their chance to do the activity earlier and now it's the girls' turn. They pick up some of the cartons on the floor, and Carmen repeats herself and tells them that they'll have to leave. Carmen leaves the group of three girls she is working with and gently escorts the boys to the door and outside of the room. She returns and closes the door and locks it and returns to the group of girls who are busy putting together a shopping metropolis.

The time allowed for the activity grows short, and Carmen asks that the girls to come back to the chairs which she had rearranged so that the girls could talk about what they had done and view all of their constructions. The girls take turns sharing what they had constructed and why they had decided to build what they had, how they had made their decisions, and why they had formed the groups and pairs that they had.

Carmen then asks them, "If boys were in here, what would happen? Would it have been a different experience?"

"They would have just taken over; we wouldn't have been able to do anything," shares an 11-year-old.

"They would have taken all the things and not let us use them," says Maria quietly.

"Some people are really mean. Some girls can be really mean, too, but mostly it's the boys," says another. "If you, like if you say something, they'll like laugh at you and say 'Oh that's so stupid! How dumb girls are!'"

"All boys want to do is chase us around."

"Sometimes you don't really want to talk very much when you're with boys in the room," shares Jennifer, with her hands folded in her lap and her shoulders scrunched up around her neck. "It makes me feel kind of giddery, like gee! people are watching me. So it's kind of like you'll feel more relaxed with just girls there." Her shoulders relax.

The group discussion is interrupted by a call at the door from a staff person. The van is ready for transportation. Carmen glances at her watch noticing how quickly the session has passed by. The girls gather up their finished creations and hurry for the door. Carmen's eyes are tear-filled as she turns to me and says, "The whole processing that took place and the sharing--they said such profound things! Those girls realize what's happening around them, even at such a young age." She then excuses herself and quickly gathers up her things as she realizes that she will have to hurry now to make her night class.

The leader's question "What would it be like if boys were here?" ignores the presence of boys in the space provided for "girls-only" settings. Though Carmen believes that it is valuable to provide the girls with time "to be with girls only, to be with just girls," boys, and even male staff members, continually interrupt the girls' Explorers sessions and that "girls only" time, and yet, girls rarely interrupted the boys' Explorers classes that I observed. Boys regularly knock on the door and/or walk in. They come in and, despite the complaints of the girls, the boys will stand there, and ignore the girls' and the leaders' requests to leave. Often they must be physically escorted from the room and the door locked to keep them out. At times, Explorers leaders consider letting boys stay.

One leader explains her thoughts on why boys interrupt Explorers sessions:

BEST COPY AVAILABLE

> ...[A]nytime you close a door and they're just curious as to, you know, "Am I missing out on something?" or "Am I not being a part? Am I missing out?"....[S]omeone might be getting something that they are not getting and so they got to check [that] out to see if that's the case...and is it something that they do want to learn.
>
> I mean I think that those boys open the door a lot. They find out everything that's going on. They're more curious....[T]hey appear to be more curious....[It's] what we're trying to develop in girls. They (girls) need to learn how to open the door.

Boys may have honestly wondered about what was going on behind the closed doors of the Explorers' room as FCYC programs were not always clearly announced or regularly scheduled. (See discussion below.) However, there were many times when boys did know that girls were engaged in activities, and they persisted in their attempts to participate. Though single-sex programs are in place at FCYC to provide girls with opportunities to "learn the positiveness and power that can come from sisterhood," boys interrupt program sessions and that is not perceived by adult leaders to be a negative thing.

Mixed-gender interactions at the FCYC expose the conflicting societal and cultural beliefs of the FCYC leadership. Though the Explorers leaders are knowledgeable about the ways in which women's and girls' oppression is embedded in society and demonstrated continuously in daily contexts, they are rarely able to provide an environment that serves to make changes in the dynamic of interaction between girls and boys at the center. For example, one leader describes how and why she often "rescues" a girl.

> ...I rescue a girl, you know, because a boy's bugging her and...she tells me, "Oh he keeps bugging me and he won't leave me alone." Sometimes I'll say [to him], "Well just leave her alone and stop pestering her, she already asked [you] now leave her alone" instead of saying [to her], "OK, so what do we want to do about it?" Sometimes it's maybe I think I can do that, but I don't have time, 'cause it's going to take...more time for me to take her hand and to say, "OK you need to tell him....What do you think you should...?" And "I'll stand here by you and you tell him to leave you alone because I'm not going to be here next time maybe, so you need to be able to defend yourself. You go over there and I'll support you and I'll stand there and you tell him and I bet if I'm there and you give him the look that you really mean business and you're not playing around, he won't do it anymore." Sometimes I don't have time for that, because I don't think about it. I just react, "Leave her alone! She said to leave her alone and stop it", you know...instead of having her do it. So I think in those rescuing situations I'm probably saying things that I'm not even conscious of at all, that I do for girls and for not having the expectations that they can do something.

So, though FCYC programs and philosophies seek to empower girls and to serve as a "vigorous advocate for youth," leaders model a contradiction--in that a girl must be "rescued"--adults must speak for her--only so that she can be "pestered" again. Importantly, Martin (1992) asserts that while women and "girls will have to learn to speak their minds and stand up for themselves..." boys will have to learn "to replace violence to others and themselves with positive acts of courage ...and counteract... male stereotypes" (p. 112). Martin further contends that males must demonstrate true courage and virtue and, within a context that advocates for such change, "renounce the macho ideal without losing their masculinity" (p.111). Therefore, boys must be engaged in a different dynamic where their behavior is confronted in a way other than punishment and scolding.

Within the larger context of the FCYC, boys often dominate adult talk and attention. It was rarely possible for me to have a conversation with a girl at either center without boys interrupting. The following example comes from field notes of a visit to the North Side Center.

• • •

I wanted to talk to a couple of girls who were sitting at the computer center and find out what they were doing. However, a nine-year old boy started talking with me about the computers and about how his father was a pilot and how he hopes to go into the space program. He talked about how he was going on an airplane trip with his father. He really tried to engage me in conversation. He continued to talk about his step-father who has a degree in chemistry and who was hoping to find a job in his field.

I was very conscious of the fact that he was taking my time. I wanted to give him time, but realized that he would take all of my time. There was no way that I was going to be able to ask these girls what they were doing or have any conversation with them, more or less provide them with equitable time. Finally, I told him that I was going to hunt up the Explorers group and he said, "Well, I'll talk to you while I walk you there."

• • •

I shared the incident with Carmen. In order to talk to girls "you basically have to shut boys off," I told Carmen. "And we're told you don't do that," Carmen quickly replied. "I mean you wouldn't do that [to] anybody but maybe there's even a stronger [message] that you wouldn't

do it to a boy, because they're less accepting of it. [With] a girl you could probably get away with...[that] a lot easier."

Kemper (in Bartky, 1990) describes this "voluntary compliance with the needs, wishes, or interests of another" as "status accord" (p. 109). For example, through frequent smiling and other bodily gestures, a woman urges a "man to continue his recital, hence, that he may continue to commandeer the woman's time and attention" (Bartky, 1990, p. 109). When such "status" is not returned, the consistent attention by a woman is "acknowledgment of male supremacy" and women's "inferior position in the hierarchy of gender" (p. 109). The contradiction--the societal message that women--myself included--should continue to listen past the point of interest, desire, or need and the inability to model a different dynamic for girls or boys is embedded within Carmen and myself. However, the message of the FCYC's mission statement--to meet the special needs of girls and the special needs of boys--would indicate that the dynamics of communication between boys and women and girls need to be changed.

Yet, Weiler (1988) points out that as individuals seek to build counter-hegemonic structures, "we must be conscious of the realities of various forms of oppression and the realities of intersecting and conflicting forms of power" (p. 125). For example, she states that feminist teachers'

> goals of addressing sexist oppression may conflict with their students on a variety of levels. The feminist woman teacher faces the resistance and use of male privilege in boys, who of course have a vested interest in maintaining their own gender privilege, particularly if they face race or class oppression. (p. 126)

In sum, it appears that leaders have not resolved for themselves how to respond differently to traditional societal expectations (i.e., boys should not be shut off from conversations or excluded from learning opportunities) and how to create for themselves and girls new and safe settings where they can develop supportive relationships. Such conflict and tension between beliefs--traditional or otherwise--and daily actions is prevalent within this coeducational organization. In sum, the co-ed environment of the FCYC does not appear to consistently provide girls with the safe havens that they need to be themselves and to develop

a sense of "sisterhood"--a support network that they can access within and outside of the context of Explorers and the Foothills City Youth Club.

Institutional Barriers

Though Explorers leaders provide girls with valued programming, it is also true that various institutional barriers appear to inhibit, and sometimes, prohibit Explorers members' participation in the science program. For example, when one leader left the FCYC towards the end of this study for a position with another organization, the FCYC did not replace her, and the Explorers group at the South Side Center did not meet after that except for one time. Also, the FCYC leadership did not always clearly announce the programs that were offered and their times. Sometimes, Explorers was held on different days and at different times and the addition or change went unannounced which meant that regular Explorers members did not know when to show up. At the South Side Center, children signed in daily, but a schedule to announce available programs from which children could choose was not posted. At the North Side Center, program leaders did not list Explorers on the posted list of programs during the first four weeks of the program session.

Other research has shown the value of regularly scheduled programs for girls. In Thurber's study of girls' participation in city park recreational programs, she found that

> girls did not... 'drop in' for unscheduled program time; the 'first-come, first-served' sign up policy did not create an environment of equity where girls felt respected and important. Designated times and places for girls...encourage girls' participation (cited in Hansen, et al., 1995, p. 18).

Some girls missed Explorers, not because they wanted to, but because they did not know that it was happening, or because some other program or sports activity conflicted with Explorers. One Explorers member stated that she only came because an Explorers leader told her about the program "'cause I didn't even know there was it." Another member pointed out that "Sometimes I'm not there....I used to have to come...for soccer, sometimes volleyball and all kinds of different sports and then, if I go (to Explorers), sometimes it's too late." A third girl stated that if she did not come to Explorers it was either because she forgot when the

BEST COPY AVAILABLE

program was scheduled or "because there's...two things going on...and I have to go to the other one."

FCYC programs and sports activities often conflicted with Explorers, and there were many times where Explorers regulars did not come or came in late because they were involved in some other activity. Therefore, the leadership of organizations such as the FCYC need to make new and continued efforts to remove these conflicts, to schedule programs and activities regularly, and to announce them so that girls and boys would when they will happen. Then members could plan and schedule personal, home, and community responsibilities around club events As the FCYC organization and its leaders have targeted several programs, along with Explorers, as valuable sources of knowledge and skills for girls, more efforts need to be made so that programs do not conflict with each other.

Lastly, the FCYC's efforts to provide programs for youth are weakly funded by the community government and its leaders, thereby keeping the organization economically disadvantaged much like the children and families that they serve. In 1991, the local government and community funding agencies forced a merger between the local Boys Youth Club (BYC) and Girls Youth Club (GYC) to form the FCYC as they saw this as a means of saving money.[2] However, the merger of the youth clubs was more costly, requiring the need to hire more staff and develop more programs. Even as the FCYC grew, doubling its numbers in four years, the community funding agencies decreased the amount of funding per child by 45%. The responsibilities of the FCYC staff increased, affording them less time to plan and interact with children in order to meet their needs. FCYC programs for children, primarily Latino and poor, suffered. Therefore, community funding agencies need to look closely at their goals regarding meeting the needs of the community and local children and the ways in which they distribute moneys to organizations like the FCYC within the community.

---

[2]For a complete discussion and analysis of this issue, see Davis, K. S. (in process). Science Support Groups: Women Working With Girls and Women in Science, Chapter 7–Economic Capital. Unpublished Doctoral Dissertation. University of Colorado, Boulder, CO.

Providing Girls With Role Models and Connections

Explorers leaders also attempt to role-model for girls that which they encourage. Carmen believes that she models enthusiasm and curiosity and that she is "just a little bit above (average) as far as...risking." She seeks contexts where not only girls learn, but where she discovers new ideas and skills herself. The leaders also believe that it is important to model for children that women can be leaders and be in charge of organizations like the FCYC. Carmen believes that it is important that children see, especially at the South Side Center, which was originally the Boys Youth Club, that the FCYC director and the program director are women.

> Just for them to see a woman know anything or do anything...I think just being program director...that they sense some power in that and that you know that it's a team effort. When we merged with the BYC...that's the first thing all those boys over [at the South Side Center], the older boys...wanted to know--"Who's in charge? Who has the power?"

Linda points out that the FCYC members "had a hard time when Janice got the position as Executive Director and Randy was the only male on staff. [They asked,] 'So how come Randy's not in charge?'" Traditionally, at the BYC, males always were in charge. She thinks that it is important to "reinforce to girls...and to also show...boys...that women can be leaders and...be in charge."

In addition, the national Explorers program advocates for the development of alliances between local Explorers groups and community science centers, museums, businesses, and professional and trade organizations. Such companies and organizations can provide girls and minorities with resources and support networks in their areas of specialization including: role models and mentors in non-traditional careers, research and work sites to visit, explore, and/or work as interns, and contexts where girls can find professionals and experts with whom they can collaborate. Explorers leaders are told to "[h]elp girls reflect on what they think and how they feel about jobs that are open to them...and to arrange for them to meet women" working in non-traditional careers. Internships are seen as valuable opportunities for girls to experience and learn more about careers and job sites.

At the FCYC, Explorers leaders talk with girls about different kinds of jobs and careers and the skills those kinds of workers need. Linda states that career preparation, along with encouraging explorations, is "a big component of Explorers." In the earlier stages of this program, FCYC members could participate in the Tours program which gave them opportunities to meet professionals and experts in a variety of careers. As part of Tours, the FCYC leaders would take club members out into the community to tour various job locations and learn more about different occupations. Questions that would be asked on tours would include: "What type of education do you need?" "What did you have to learn to be this?" "What special skills do you need?" For example, on one trip, a woman archeologist took the children on a tour of nearby fossil beds and then she was interviewed by FCYC members.

Yet, during the time of this study, there were few community connections for the girls in the FCYC Explorers groups. A female high school science teacher, was invited by the Explorers leaders to come to the North Side Center for a few hours one Friday afternoon. She planned, organized, set up, and supervised several hands-on centers for the children. However, though the children were told of her presence and that she had brought science activities in which they could participate, the science teacher was never introduced to the children. No special effort was made to connect her with Explorers members or for the children to hear her thoughts about how she had entered her career and what her job was like.

Importantly, though, by accessing the children to the social capital of the high school science teacher, the Explorers leaders provided some FCYC members with opportunities to acquire additional cultural and economic capital as I described in my field notes and later journal reflections.

• • •

The Explorers leaders' invitation to the high school science teacher to come to the center brought science activities, materials, and equipment to the children that the FCYC might not have been able to provide. Here was this young woman, confident in her subject matter and knowledgeable and calm, there at the center to share some science with whatever children showed up.

The children played and experimented. They constructed boomerangs from tag board, launched straw rockets powered by balloons, examined rocks with a hand lens, made bubbles on a table lathered with soapy water, and examined cheek cells under a microscope. At the bubble table, one of the girls was blowing hard through the straw trying to form bubbles from the soapy film and not having much success. The teacher told her not to blow so hard, but instead, blow "like a whisper."

There were few rules. It didn't matter if water spilled onto the floor or if the children got methylene blue on the microscope. Kids adapted as they saw fit in order to try to solve problems.

The Explorers leaders' social capital--the knowledge of someone who had science knowledge to share--and their ability to get that person to come to the FCYC and to share that knowledge with them and the children proved valuable. The leadership didn't give her fanfare, but they did give her entry, and likewise, the teacher gave the children entry into the world of science.

• • •

In sum, such connections between community resources and girls seem valuable as organizations like the FCYC seek to provide girls with access to participation in science.

Summary

As institutional agents, the Explorers leadership provides the groups' members with the necessary materials, meeting space, and program structure so that Explorers can occur and so girls have the opportunity to engage in scientific inquiry. Without the leaders of these groups, the girls would have to fund science activities themselves, seek them through some other resource, or not experience them at all. The leadership also provides Explorers members with opportunities, albeit few at the time of this study, to further develop connections with other community resource people (i.e., a local science educator).

As individuals work together to gather and share information in order to construct new understandings, the leaders of the Explorers would like the groups' members to also develop a sense of sisterhood. Sisterhood would provide girls with friendship as well as with acknowledgment for who they are as individuals and with support for the daily decisions that

they make, for the actions that they take, and for the pursuit of the long-term personal and career goals that they choose.

Though Explorers leaders as institutional agents have the power "to situate youth within resource-rich social networks" (Stanton-Salazar, et al., 1995, p. 4), it appears that institutional barriers and/or conflicting cultural and societal expectations and beliefs on the part of the Explorers members and the leadership as well as families and other community members interfere with leaders 1) providing consistent support for Explorers goals and programs, 2) making many connections for girls with resources, support structures, and other institutional agents within community, and 3) with leaders and girls' ability to change the ways in which boys and girls interact with each other. Critical to girls' legitimate participation and acquisition of valued capital will be the acknowledgment, discussion, challenge, resolution and/or removal of such institutional barriers and constraints and vigilance regarding their reemergence as well as implementation of practices and ways of being that differ from those that are often considered more traditional.

Women in Science

Introduction

The Women in Science come to their group with a great wealth of scientific, mathematical, and technological knowledge, especially that which is relevant to their particular science fields. They, as well as the science community (AAAS, 1989; AAAS, 1993), highly value the science knowledge and skills that they hold. All of the WIS members have graduate degrees in their science fields and have participated in not only school science but also in research science. As they walk to the WIS meeting place from their labs or as they settle down at the table with their cups of tea or coffee, they easily converse about their research, their progress and problems, and the methods and tools of their fields of study.

As they come to the regular weekly meetings, it is not the content knowledge of their discipline or any other that they seek. Their questions during the meeting are about the culture of the science community. Much of what the women in this group seek can be described as the

indeterminate or tacit knowledge of the science community (Delamont, 1989)--those hidden aspects and ways of the science community, the implicit competencies of being a scientist, especially a woman in science, and the undescribed ways of being a member of the science community.

Lack of such knowledge serves to frustrate the women in their work and to leave them without important information that affects their careers. Therefore, they seek knowledge about human society--particularly the science society. The WIS members focus on 1) human/scientist/male/female behavior and the interactions that they have with their colleagues, 2) social conflict in their everyday work environment, 3) the social trade-offs that they need to consider within their occupations, and, importantly, 4) how they can create change in the science community. This is the kind of knowledge about science that they seek as part of this group.

Through the capital that they hold and through their networking within the group, the women in WIS have the opportunity to 1) construct new knowledge and acquire more cultural and social capital valued by the scientific community and 2) receive support from the group's participants. WIS participants act as "institutional agents," allies, and mentors not only for each other but also for those outside of the group and, therefore, provide individuals with better understanding of the practices of the science community and opportunities for increased participation.

Constructing New Knowledge and Acquiring Valuable Capital

Throughout this study, the WIS participants made important issues explicit and/or constructed new understandings that were valuable to their everyday lives and success in science. For example, the group provided WIS members with a context for the construction of ways to make professional contacts and acquire economic support. The women in the WIS group understood that making new contacts is valuable in the science community, whether the contact

is a possible funding source, future advisor, PI, colleague, or someone to provide one with information or further networking.

"Schmoozing" is one way of making important contacts within the science community. The WIS participants describe "schmoozing" as making telephone calls, attending receptions and cocktail parties, and meeting new people. One example of "schmoozing" that a member of the group often repeats is that of the researcher who schedules a yearly trip from the west coast to Washington, D.C. just to have dinner with a person with position and power at NSF so that he might continue to receive NSF funding.

Though the WIS participants understand the importance of making such contacts in order to get funding or important positions, some find it very uncomfortable to be in social settings where they are with people whom they do not know. Others see schmoozing as an activity that is less than honest, as individuals converse with others mainly to acquire something. They see that some schmoozers overcommit--promise to accomplish more than they can do in order to get funding, matching grants, or a position. The women in the WIS group have discussed studies that show that men commonly schmooze to obtain funding and positions, whereas women "apply" (i.e., they fill out applications completely and submit them on time). Some of the women state that simply applying for funding or a position should be enough and that making personal contacts should not be necessary.

However, WIS participants do realize that such contacts are important. Within the WIS group, members discuss with each other what individuals might prove to be important contacts and what kinds of valuable information they might provide. For example, one member sought the advice of the group when a grant she had submitted had been turned down.

• • •

One member began the meeting by telling us that she didn't get an invitation to apply for this grant. She was really disappointed. One concern that she had was that if she did not get enough money in outside grants, she would have to teach an extra class and that would further limit her time to do her research. She did receive something in the mail about a state grant which required matching money from some other institution, organization, industry, or business. So she was trying to think who she could get to give her some matching money. Lynn

mentioned a company that was situated in Iowa that she knew about. Sandra knew of a huge organization that oversees other organizations and companies that might be a resource. The member facing the problem thought that she could also go back to a local company that was enthusiastic about her grant proposal in the first place and see if they might give her some funds. Sandra mentioned some people who might be willing to work with her on this matching grant; one individual was located in Kentucky.

Another member mentioned that it is important to make telephone contact with the people giving out the grants. From them, one can find out what they are looking for in the way of proposals and also to find out who had been given this kind of money before and for what. Sometimes they provide booklets that list who had received these moneys and what their projects entailed. Then an individual could call any one of these people and ask them for more information about their particular project and what factors they felt led to their getting funded. The member with the problem was surprised to hear about these booklets, and she wondered if NSF had such information available. The women around the table thought that maybe they did.

• • •

In this WIS meeting, participants shared with this member additional social capital in the form of networks (i.e., the names of important individuals and their companies) whom she could contact for funding. The group also provided her with more cultural capital as they shared with her that contacting such individuals was important and that she could also access valuable information that would aid her in the writing of grant proposals and eventually aid her in the possible acquisition of more economic capital. As a result, women in the group have the opportunity to begin to construct what may be perceived as a direct way to access important social, cultural, and economic capital that contrasts with traditional approaches (i.e., "schmoozing").

Issues that the group made explicit and understandings that they constructed during this study included:

- Faculty are not highly regarded if they are not actively involved in research.
- There is an expectation that one will work 70-90 hours/week in the lab.
- There are time conflicts between caring for families and oneself, maintaining relationships, and doing scientific work.
- There is a lack of job possibilities in the science community, especially academia.
- Soft research is not respected in the science community.
- Taking a non-tenure track position will not get one a tenured-track position.

- Individuals in science are asked to conform to a competitive model.
- Communication is competitive and aggressive within the science community.
- Individuals in the science community are expected to "schmooze" in order to access necessary capital, especially economic capital.
- Individuals "new" to science need mentoring.
- Resources are available to support women in the sciences.
- Women have made changes in professional organizations with the support of other women.

Providing Support

The interactions of members in the WIS group also provide its members with support, effective help, and assistance. One member emphasizes that within the everyday work environment of the WIS participants, "[P]eople are sucked in, chewed up, and spit out in little bits and pieces; it's the way things are done." She believes that it is important to offer individuals support and "not let people be crushed by the system." (Emphasis is the speaker's.)

Within the group, members have supported each other in such ways as: encouraging members to speak up in departmental meetings, presenting a range of ways to solve work-related problems, modeling various career choices, reviewing grant proposals, helping someone get out of a bad lab situation--seeing it coming and forewarning them, reading drafts of papers and giving critical feedback, and writing letters of recommendation. Giving support means helping individuals "take action about things." The following field notes provide an example.

• • •

#1 At about 5:20 PM or so the meeting started to break up. Someone had to go which made everyone look at their watches and realize what time it was. One member quickly asked a last minute question, "What would you do if you were asked to serve on a committee as a token woman?" It was clear to her that she had been asked to be on the new faculty search committee because she was a woman. "We need to have a woman on this committee," she was told.

Another faculty member stopped her exit and gave this question her attention as did the other individuals in the room. The importance of the committee was noted as it meant the possibility of bringing women faculty to the department. Someone also pointed out that the amount of power on the committee might not be that great as she would be the only woman. The suggestion was made that she should negotiate to have two votes. The member with the dilemma also mentioned how she was already overwhelmed with a lot of committee work, including faculty evaluations which was very time consuming. It was suggested that she

negotiate to get off of that committee to be on this one. The member seemed to appreciate the suggestions. People then began to depart.

#2 This week the WIS member with the committee problem mentioned that she had taken the advice of the group and talked to the chair of the faculty search committee. She told him that she would like to serve on the committee, but that she was overworked with her evaluation committee assignment. Could she just change committees? It was coming up for a faculty vote that afternoon and he hesitated. She asked, "Can't you delay the vote on that committee?" He did.

• • •

This WIS member saw that without the support of the women in the group and the opportunity that she had to discuss her problem, she

> might not have had the courage to go to the department chair and say, "Yes, I'll do that, but take me off...this other one." I might have rolled over and died...accepted all the committee work they wanted to lay on me and just do it instead of standing up for myself. Because sometimes you think--by yourself... you aren't talking to other people about things--you think, "Oh my gosh, why should I be complaining about this?" But then, other times you look at what your colleagues are doing--they wouldn't do that.

So, WIS members not only have the support of the women in the group, but they also have opportunities to talk through their problems. WIS participants describe the importance of having support to address the problems that they encounter daily in their work environment. One participant states: "[I]t's that emotional support...that is important for women, especially if they are isolated in their department."

Mentoring

Initially, the WIS group was organized by graduate students who sought various kinds of support from the female faculty. The graduate students sought departmental approval for the group's meetings, and it was the faculty women who signed meeting notices and who reserved conference rooms in the department. Graduate students also sought to access the faculty women's knowledge of and experience in the science community and to develop professional relationships with them. A graduate student states

> I wanted them to be there because I wanted access to [the female faculty] in a different sort of way...[It] was pretty exciting to get to know these women...[I]t was just talking about things. It was sort of brown bag lunch and we would ask them questions like "What was your experience like?"....We got them to talk about their job interviews....[S]o I think there were a couple of things: 1) We got to hear their stories [and] 2) by them telling us the stories, there was really a camaraderie built that included us with those faculty members.

So during the first year, the group's discussions "centered on topics that would help graduate students" and that provided them with a kind of mentoring.

The WIS participants value mentoring, yet they have little experience with being mentored or it has come late in their careers. Few of the women describe their relationships with advisors or PI's as mentoring. Since the group's inception, the WIS group has frequently helped graduate students problem-solve the difficulties that they have had with advisors, committee members, and PI's.

For example:

• • •

Jane Riddle still finds it difficult to speak about her research before a group after being grilled by a male member of her committee over one question during her graduate comprehensive exams. She explained to the women in the WIS group that no answer that she gave him was good enough to stop his extensive attack. Her many detailed and thoughtful attempts did not quell the attack, nor did her exhausted, frustrated, and final "I don't know." She later discovered that there was no way that he could have expected her to know the specific answer that he was seeking. The research on which the question was based was not published in Biological Abstracts,[3] but was written as an in-house work at the professor's last academic institution. A year later, his explanation for his questioning was that, after comprehensive exams, students should feel like "they [had] been run over by a truck."

• • •

After her comprehensive exams experience, Jane was greatly concerned about talking in public forums as these field notes show.

• • •

---

[3]Biological Abstracts is the world's largest and most comprehensive abstracting source covering the literature internationally in the life sciences. Abstracts are included from approximately 8,580 serial titles (Personal communication, Norlin Library, University of Colorado).

Jane wanted Mary's feedback. Jane's advisor wanted her to give a talk instead of a poster session at an upcoming meeting. Jane had some reservations about this because this was one of the worst conferences when it comes to the aggressive kind of discourse that the WIS group has talked about so many times. Jane was really concerned about it especially after what she went through with her comps last year.

Though Mary was on Jane's committee, she was on sabbatical during Jane's comprehensive exams. Before the exams, Mary had invited Jane to come to the university where she was on sabbatical to talk to her graduate student women's group. After the comps experience, Mary encouraged Jane to still come and not only give a talk about the WIS group but also a scientific talk while she was there. Even though Jane was still upset over her comprehensive exams, she went and did that, and there was a lot of interest from both of her audiences for what she had to say.

• • •

Importantly, Mary encouraged Jane to continue to present her research despite the negative experience that she had with her committee, and Mary also provided Jane with a safe setting in which to do that. In addition, she continued to talk with Jane about presenting her work in challenging settings.

Graduate students view Mary as a "resource person" and a "role model." One WIS member points out that Mary was the "only person early on in my graduate career to raise issues like salary discrepancies between men and women in the department." She describes Mary's "informal mentoring" as important because "there's very little positive reinforcement that one gets from a lot of the advisors in the department in terms of continual feedback as to how you're doing."

Funding determines who has the opportunity to serve as "formal" mentors for graduate students. No matter how talented, supportive, and/or concerned one might be, without grant money, professors cannot financially support graduate students and, thus, cannot formally mentor them. One WIS member stated:

> I have had graduate students....I really feel frustrated not having a big grant and not enough money to support a student, because I have a lot to offer....I have to be an entrepreneur in order to be able to function in that way. I have to get big money....I...wish I had some of the money...[because] I wish I could mentor students.

BEST COPY AVAILABLE

WIS members work to support graduate students and post-docs--both WIS members and non-members--who experience difficulty with advisors and/or departmental practices. One way they do that is by making explicit the dynamics of the community. For example, one professor stated:

> ...I might have ideas or insights that they might not have because they haven't been there, especially if they are graduate students....I can look at it from the other end, the power end of it, if you want to look at it that way, what could be going on with the professor...just give them that feeling about what's really going on....[S]ome of these situations that people find themselves in are one thing on the surface, but there's something else really going on....[J]ust having more experience and being older...understanding what drives some issues, but that just comes because I've been around longer and I've been at this longer and after that [it's] either because of what I've suffered through or what other people have suffered through...

In WIS meetings, this member readily shared stories that illuminated the experiences that she and other women have had within the science community--many of which were painful and frustrating. For example, she described how early in her career as an untenured assistant professor, she was regularly harassed by a tenured male colleague. He would yell at her in the hallway of the department about things that were untrue. He would rudely interrupt her meetings with graduate students. He also expected her to help him work on his "pet project" on a Saturday when it was usually his "wife or sister-in-law" who gave him the computer assistance he needed. Then he would be significantly late and expect her to stay until the project was completed. He would become very irritated with her when she wanted to leave. She relates that years later he admitted to her that "if I hadn't been a woman, he wouldn't have treated me that way."

Further, she said that

> I feel that when I first came to the department, I was very, very enthusiastic. I was on top of my research, very dedicated to research...and then, through my experience, when I first came, I think part of me did die.

In order to be successful allies and advocates, women science educators may need to recognize bias and sexism within the science community (Martin, 1989), "to see, hear, and know what is happening in a complicated and deep way" (Dorney, 1991, p.236), to face their own struggles within that community, and to confront themselves and examine their own values

about what they are willing to risk in order to attempt to enact change (Brown, 1991). By sharing stories that describe her experiences, this WIS member acknowledged the ways in which women are treated within the system, and, therefore, she legitimized other women's experiences as well.

Jumping off the Straight and Narrow Academic Track

Women in this group sought support as they contemplated and made career choices. Many WIS members have faced the point of "jumping off the...straight and narrow academic track" as defined by traditional research science--"grad student, postdoc, first job, preferably at an early age." They cite the lack of job availability in academia as one reason for the change. For example, Carol Rogers is now "... in a situation of doing a second postdoc and facing being geographically restricted..." She has a spouse who has a job, and, if she was offered a position elsewhere, her husband would need to find a new position which might prove difficult. She could choose to place herself in the pool of job applicants but "people who are offered jobs have no control over where they will end up unless they're super stars in the field, and there are not many of those who get jobs in wonderful places."

Some of the support sought by WIS members comes through group discussions that make the structure and practices of the science community "transparent" (Lave and Wenger, 1991). For example, through discussions within the group, WIS members point out that the science community does little to acknowledge or to take into consideration that scientists are members of families and other social communities. Members of the group often talk about the expectation within the profession that labs be up and running around the clock. Lights are often left on; graduate students are expected to run experiments throughout the night. The story is told of the faculty member who delivered her baby at a local hospital and then drove herself to the lab to make sure that it was in full operation. WIS members often talk about the large number of hours that the science profession demands and how that impinges on their personal and social lives.

BEST COPY AVAILABLE

• • •

Carol asked Martha how she did it, working like she does and having a family. Carol referred to Martha as her mentor or someone to look at as an example as someone who always seems so calm. Martha was laughing and said, "Well I'm really not all that calm." She shared how she usually feels guilty for not doing what she hoped she could do, that there was always something more to be done and not only the home but at her job. Plus there is this conflict, this stress, about not being to able to do everything she wants to do. Recently, she was home for some surgery, and she actually got to sit and read a book of her choosing. It was really like a vacation. The kids were in school, and it was really nice. Normally she feels stress from not getting everything done that she'd like in both arenas .

• • •

Martha points out that

> it is a real struggle to make this work and to get enough...good work done, to keep the money coming, etc., and still...have the time that I want with my children....The choice I made to have children--the choice I make to spend time with them--these are to the detriment of my career....I don't regret my choice. I only regret that it has a negative effect on my career...

"How to have your children and time with them and still have your competitive career?" is a question that she continues to ask.

Women in the WIS group discuss the fact that most scientists are men who for so long have had stay-at-home wives to take care of their families, even when they worked around the clock at the lab. The profession has not evolved with the changing times of both spouses working outside the home in professional, and often scientific, careers. Few positions are made available in departments that would allow for the hiring of a married couple. Women who deal "with these things in a different way by either sharing a position with someone, like a husband and wife team...or trying to find an alternate career [to academic research science]...so that they [can] live their life and have a [science career] at the same time" are criticized or frowned upon. Mary points out that

> It's a crime to tell students, give the message that the only enlightened path is to be a professor and have your own lab...[be]cause how many jobs are their going to be? But there's extreme pressure to just follow one pathway, and that they would feel like "science drop outs" if they would do anything different.

For example, as Carol decides to stay in the geographic area for a period of time, she faces such consequences. She said, "[T]hat immediately makes [your PI] perceive you differently in terms of somebody they want to invest their resources in who's [going to] go on and propagate the lineage so to speak." It appears that her postdoc advisor believes that if she was to acquire a lab of her own, Carol would eventually pass on the inheritance of his research style and agenda to others. However, if she continues to work in research at her current level or if she decides to teach, her value as a member of the "bloodline" decreases.

Carol believes that "it would really be useful to have people [in WIS]...brainstorm ...about what concrete things...I could do to work myself into a more secure niche." Carol has observed the women in the WIS group and the

> ways different individuals have dealt with the cost of jumping off the narrow academic track...and have found creative ways to use their talents and to continue their interests...Being in a group together where those things are there, makes one aware of the value of those choices, and also it's sort of a confidence building thing that those are valid choices, even though they're not on the traditional straight and narrow path.

For example, one WIS member, because of family and children, has chosen to do "soft" research; she supports her work by generating funds from research grants. Though housed in the department, she has no tenure. However, she paints her chosen path as "precarious." She explains that when she chose the road "to stay on soft money" there were

> twice as many grants as [there are] now. So it wasn't quite so cut-throat....For twenty years, I have been doing this and it has been working...but it doesn't give me the feeling that I can guarantee that it will continue to work....It has always [been] a little bit touch and go....I thought it was obvious to everyone that it was a rather precarious existence.

Neither Carol Rogers nor these women can calculate what the "costs" are to their futures in science as a result of jumping from the traditional academic track. However, through their interactions with each other, they are gathering increasing knowledge about the expectations, obstacles, and practices of the system that surrounds them. In addition, they are creating for themselves that which best fits their definition of self.

Summary

Using inquiry skills long-held as research scientists and science educators, WIS participants work together to answer questions and to solve problems that they have about the science community. Together they gather information; share their thinking, observations and experiences; and construct solutions and new approaches to test in their everyday work environment.

Within the context of the group, WIS members serve as allies and institutional agents in that they seek to support newcomers to their community by providing them with the knowledge of their community that is often kept hidden and which can interrupt one's access to legitimate participation within the science community. In addition, they have developed a network within the group to provide each other with that same support and knowledge and also with additional resources that they can access within the institution and the science community.

Importantly, WIS participants provide each other with support as they address issues and put new practices into place. WIS members listen with understanding based on common experiences, provide encouragement to address difficult and challenging situations, and offer additional information about the underlying social structures and practices of the science community.

SUMMARY

Both Explorers and the Women in Science group seek to capture the capital of the science community and to sometimes challenge and change what capital is valued. For the Explorers group, the open door to capital acquisition comes through the engagement in the process of science. The leadership of the FCYC and Explorers serve as institutional agents in that they provide girls 1) with programs and activities that engage girls in scientific inquiry, 2) with encouragement to engage in the practices of the group by getting dirty and having fun, and 3) with connections with non-traditional role-models and support structures inside and

outside the FCYC. Such practices are geared to build girls' self-confidence in science, to motivate girls to stick with math and science coursework, and to increase girls' access to legitimate participation in science. Such practices are key to the acquisition of knowledge and identity valued by a community (Lave and Wenger, 1991).

However, institutional barriers and societal and cultural expectations interrupt Explorers participants full access to all of their potential resources, including sisterhood, and to full participation in the Explorers groups. Therefore, individuals, such as the Explorers leadership, who express commitment to providing girls with such access and opportunities, must examine the setting from a systemic approach (Anderson, et al., 1994) and further investigate, discuss, challenge, and address structures, practices, beliefs and expectations that inhibit/prohibit girls' access to science participation.

The WIS group seeks to make transparent the ways and practices of the science community. The "culture of science" is the cultural capital that they wish to acquire. Their networking within the group is such that they serve as institutional agents for each other as well as for others outside of the group. They are committed to providing newcomers and those not so experienced and knowledgeable within the science community with support and with that knowledge of the science community that is often hidden so that they can avoid being "crushed by the system."

Finally, the interactions of the WIS participants illuminate how such communities can serve as valuable settings for the construction and acquisition of knowledge and capital. Within the context of WIS, members express and clarify their own knowledge; hear the thinking and experiences of others; and observe how others address and/or solve problems. Such interactions provide opportunities for group participants to bridge and connect their thinking with that of others and so to better enable them to answer difficult questions, solve complicated problems and/or dilemmas, and make explicit that which before was hidden. They also construct among themselves new and valued knowledge and approaches to implement

in their daily work environment. Therefore, participants have the potential to further access participation in the science community.

BIBLIOGRAPHY

American Association for the Advancement of Science (1989). Science for all Americans: A project 2061 report on literacy goals in science, mathematics, and technology. Washington, D.C.: AAAS.

American Association for the Advancement of Science (1993). Benchmarks for scientific literacy: Project 2061. New York: Oxford University Press.

American Association of University Women (1992). How schools shortchange girls. Washington, D.C.: AAUW.

Anderson, R. D., Anderson, B. L., Varanka-Martin, M. A., Romagnano, L., Bielenberg, J., Flory, M., Mieras, B., and Whitworth, J. (1994). Issues of curriculum reform in science, mathematics, and higher order thinking across the disciplines. Washington, D. C.: Office of Educational Research and Improvement, U. S. Department of Education.

Bartky, S. L. (1990). Femininity and domination: Studies in phenomenology of oppression. New York: Routledge.

Bourdieu, P. (1986). The forms of capital. In Richardson, J. G. (Ed.) Handbook of theory and research for the sociology of education. New York: Greenwood Press.

Bourdieu, P. (1990). In other words: Essays towards a reflexive sociology. Stanford, CA: Stanford University Press.

Bourdieu, P. and Wacquant, L. J. D. (1992). An invitation to reflexive sociology. Chicago: University of Chicago Press.

Brown, L. M. (1991a). A problem of vision: The development of voice and relational knowledge in girls ages seven to sixteen. Women's Studies Quarterly, 1 and 2, 52-71.

Brown, L. M. (1991b). Telling a girl's life: Self-authorization as a form of resistance. In Gilligan, C., Rodgers, A. and Tolman, D. (Eds.) Women girls, and psychotherapy: Reframing resistance. Binghamton, NY: Haworth Press.

Connelly, F. M. and Clandinin, D. J. (1988). Teachers as curriculum planners: Narratives of experience. New York: Teachers College Press.

Davis, K. S. (1991). The participation of women in science: The road less traveled. Masters Thesis. Evanston: National Louis University.

Delamont, S. (1989). Knowledgeable women: Structuralism and the reproduction of elites. New York: Routledge.

Dorney, J. (1991). "Courage to act in a small way": Clues toward community and change among women teaching girls. Dissertation thesis. Harvard University.

Eisenhart, M., Finkel, E., and Marion, S. F. (in press). Creating the conditions for scientific literacy: A re-examination.

EQUALS (1989). EQUALS startling statements. Berkeley: University of California.

Erickson, F. (1986). Qualitative methods in research on teaching. In Wittrock, M. (Ed.). The handbook of research on teaching. 3rd Edition. New York, Macmillan.

Fine, M. and Zane, N. (1991). Bein' wrapped too tight: When low-income women drop out of high school. Women's Studies Quarterly 1991, 1 and 2, 77-99.

Gilligan, C. (1990). Joining the resistance: Psychology, politics, girls and women. Michigan Quarterly Review, 29 (4), 501-535.

Hall, R. M. and Sandler, B. R. (1982). Out of the classroom: A chilly campus climate for women? Washington, D.C.: Association of American Colleges.

Hansen, S., Walker, J., and Flom, B. (1995). Growing smart: What's working for girls in school. Washington, D.C.: American Association of University Women.

Harding, S. (1991). Whose science? Whose knowledge? Thinking from women's lives. Ithaca: Cornell University Press.

Jenkins, R. (1992). Pierre Bourdieu. London: Routledge.

Johnson, D. W. and Johnson, R. T. (1994). Learning together and alone: Cooperative, competitive, and individualistic learning. Boston: Allyn and Bacon.

Lave, J. and Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.

Martin, J. R. (1989). What should science education do about gender bias in science? In Herget, D. E. (Ed.) The history and philosophy of science in science teaching. Tallahassee: Florida State University.

Martin, J. R. (1992). The schoolhome. Cambridge: Harvard University Press.

Moraga, C. (1983). Preface. In Moraga, C. and Anzaldua, G. (Eds.) This bridge called my back: Writings by radical women of color. New York: Kitchen Table: Women of Color Press.

National Science Foundation (1992). Women and minorities in science and engineering: an update. Washington, D.C.: National Science Foundation.

Nicholson, H. and Fredericks, J. (1991). The explorer's pass: A report on case studies of girls and math, science, and technology. New York: Girls Inc.

Oakes, J. (1990). Opportunities, achievement, and choice: Women and minority students in science and mathematics. In Cazden, C. B. (Ed.) Review of Research in Education, 16, 153-222.

Sadker, M., Sadker, D., and Klein, S. (1991). The issue of gender in elementary and secondary education. In Cazden, C.B. (Ed.) Review of Research in Education, 17, 269-334.

Spradley, J. P. (1980). Participant observation. New York: Harcourt, Brace, Jovanovich.

Stanton-Salazar, R. D., Vasquez, O. A., and Mehan, H. (1995). Engineering success through institutional support. In Murtado, A. (Ed.) The Educational Achievement of Latinos, Vol. II. Santa Cruz: Regents of the University of California.

Trask, H. K. (1986). Eros and power: The promise of feminist theory. Philadelphia: University of Pennsylvania Press.

Vetter, B. M. (1992). What is holding up the glass ceiling? Barriers to women in the science and engineering workforce. Occasional paper. Washington, D.C.: Commission on Professionals in Science and Technology.

Weiler, K. (1988). Women teaching for change: Gender, class, & power. New York: Bergin & Garvey Publishers.